View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by Elsevier - Publisher Connector

Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 112 (2014) 1167 – 1176

Procedia
Social and Behavioral Sciences

International Conference on Education & Educational Psychology 2013 (ICEEPSY 2013)

The Use of ICT in Preschool Education in Greece and China: A Comparative Study

Xia Liu[a]—, Eugenia I. Toki[b], Jenny Pange[a]

[a] *Laboratory of New Technologies and Distance Learning, Department of Early Childhood Education, School of Education, University of Ioannina, Ioannina, 45110, Greece*

[b] *Department of Speech and Language Therapy, Technological Educational Institute (TEI) of Epirus, Ioannina, 45500, Greece*

Abstract

The use of Information and Communication Technology (ICT) in preschool education is an important research issue, and accordingly a wide range of research results have been published. This paper analyzes and compares the research findings on ICT use in preschool education in the past decade in Greece and China. The main analysis framework of this paper focuses on three aspects: (i) access to and use of ICT in preschool; (ii) ICT and preschoolers; (iii) ICT and preschool teachers. Finally similarities and differences of the ICT usage in preschool settings in the two countries are discussed and concluded.

© 2013 The Authors. Published by Elsevier Ltd.
Selection and peer-review under responsibility of Cognitive-counselling, research and conference services (c-crcs).

Keywords: ICT; preschool teachers; preschool education; Greece; China; comparative study

1. Introduction

Living in the digital age and in a knowledge-based society, Information and Communication Technology (ICT) plays a major role in almost every aspect of the modern life and particularly in education (World Bank, 2003; United Nations, 2005; Organization for Economic Cooperation and Development, 2006; Kozma, 2008; Toki & Pange, 2012). Many countries have realized the importance of ICT in education. Therefore they issued relative education policies and invested in ICT-related hardware, software, internet access in the school and teacher training (Hepp, 2004; Ministry of Education, Finland, 2004; Ministry of Education, Singapore, 2006; Papanastasiou & Angeli, 2008; Kozma, 2008; Lee et al., 2008). Some researchers even consider that "*there can hardly be a country in the world which is not currently engaged in the process of introducing ICT into its education system*" (Tsitouridou & Vryzas, 2004).

* Xia Liu. Tel.: +30-265-100-5768; fax: +30-265-100-5809.
E-mail address: liux825@hotmail.com; toki@ioa.teiep.gr; jpagge@cc.uoi.gr

1877-0428 © 2013 The Authors. Published by Elsevier Ltd.
Selection and peer-review under responsibility of Cognitive-counselling, research and conference services (c-crcs).
doi:10.1016/j.sbspro.2014.01.1281

ICT's potential benefits in the educational settings are well documented at all educational levels from preschool to higher education (United Nations, 2005; Pange, 2005; Toki et al., 2009; Schmid, 2009; Wise et al., 2011; Toki & Pange, 2012). Precisely, ICT use in education can create new educational environments, provide new teaching methods, change the traditional teacher-student relationship and finally improve the quality of education. Hence, ICT can be considered as "potential tools for change and innovation in education" (Tezci, 2009). Additionally, the use of ICT at school is an effective way to develop individuals who are proficient in ICT (Tondeur et al., 2007) meeting the demands of modern information society. Consequently, some studies prophesied that "*the importance of educational technology in the classroom will continue to increase*" (Becker & Ravitz, 2001).

As technology market is rapidly developing, particularly the market of serving early childhood education, the availability and usage of technology for young children is widely spread and comes in to serve the youngsters much earlier (Siraj-Blatchford & Whitebread, 2003). Young children are growing up in a new era, in which a broad range of modern technologies are utilized, both at home and in preschool. As the researchers stated, *"even the youngest children live in a media-saturated world and magnitude of their technological experiences differs substantially from that of previous generation"* (Wartella, et al., 2005). In this context, there has been considerable international attention given to the issue of ICT use in preschool education. A series of research topics have been explored, for instance 'current landscape of ICT use at home or at preschool' (Plowman & Stephen, 2005; Plowman et al., 2008; Nikolopoulou et al., 2010; Natsiopoulou & Bletsou, 2011), 'impact of ICT use on preschoolers' (Pange, 2003; Clarke, 2005; Voogt & Mckenney, 2008; Toki & Pange, 2010; Panagiotakou & Pange, 2010), 'preschool teachers' beliefs and views towards ICT use' (Angeli, 2004; Pange, et al., 2004; Tsitouridou & Vryzas, 2004; Gialamas & Nikolopoulou, 2010) , 'preschool teachers' ICT competence training and application in the educational setting' (Pange, et al., 2004; Chen & Chang, 2006; Toki et al., 2009; Pange, 2011).

The aim of this paper is to analyze and compare relative research on ICT use in preschool settings in Greece and China during the last decade. More specifically, in the light of research findings, this study examines three aspects: (i) access to and use of ICT in preschool, discussing ICT policies and projects, facility establishment, as well as teacher's ICT use in the classroom; (ii) ICT - preschoolers, focusing on the impacts of ICT use on preschoolers; (iii) ICT - preschool teachers analyzing teaches' views and attitudes towards ICT use, teachers' ICT competence and training.

2. Methodology

The research method of this paper is a comparative study. The frame of the comparison is divided into three parts: (i) access to and use of ICT in preschools; (ii) ICT - preschoolers; (iii) ICT - preschool teachers. Under this framework, through description and analysis, the differences and similarities of ICT use in Greece and China are concluded.

Regarding the literature review and analysis, English-written, Greek-written and Chinese-written academic papers from 2003 to 2013 were collected. For the English language paper, the main search engine was Google Scholar. The key words "ICT", "technology", "computer", "internet" were searched along with "preschool", "kindergarten", "early childhood", "children" and "preschooler" respectively both in Greek and Chinese preschool education. In terms of Greek language we used a translation of the previously mentioned terms and searched in Google Scholar. The key words used, were: "προσχολική εκπαίδευση" [in English: preschool education], "νηπιαγωγείο" [in English: preschool], "νήπια", "μαθητές νηπιαγωγείου" [in English: preschoolers] were looked for in company with "ΤΠΕ" [in English: ICT], "υπολογιστές" [in English: computers] and "νέες τεχνολογίες" [in English: new technologies] respectively. For the Chinese language, the biggest and most widely used searching engine in China "CNKI" [China National Knowledge Internet, in Chinese: 中国知网] was applied. The key words "学前教育" [in English: preschool education], "幼儿教育" [in English: preschool education], "幼儿" [in English: preschoolers] and "幼儿园" [in English: kindergarten] were searched with "ICT", "电脑" [in English: computer] and "信息技术" [in English: information technology] respectively.

After selecting, and reading 45 papers for Greek preschool education and 35 papers for Chinese preschool education all 80 papers were categorized for further analyzing. The criterion for selecting papers was mainly based on the relevance of contents of the article on ICT use and the validity of results. According to these 80 papers, this study which is the first one on this topic, explores the use of ICT in preschool education in both countries.

3. Results

3.1. Access to and Use of ICT in preschool

In Greece, the government began to launch a national strategy for integrating ICT into education in the early 1990s (Tsitouridou & Vryzas, 2004). The Ministry of Education encourages ICT integration in education sector. Under its support several programs were implemented aiming at ICT's further development in hardware (computers facilities, networks and broadband connections) as well as software and services (educational software, educational portals, and educational services). Regional support centres (KEPLINET) were also established as regional organizations to provide technical support, guidance and training to educators working either at computer labs or at ICT networks at schools. The European Union and Greek government invested a large amount of funds for ICT usage in education, for example, the "Information Society programme" (2000-2006) spent 20 million Euro per year for ICT-related facilities and services, and the "Information Society Office programme" (2000-2006) also invested heavily on ICT infrastructure. Through the efforts, ICT infrastructures at all levels of education have been greatly improved (Suhonen, 2011). Basically almost all the Greek schools, including preschools, have access to computers and internet, and the usage of them is progressively rising (European Commission, 2006).

However, the equipment level and ICT application in class by teachers in Greek preschools have more space to improve. According to one survey, in Greece every 17 students can share one computer, only 13% of internet is connected via the broadband, and 36% of teachers have used computer in class, which is at the bottom of EU25. (European Commission, 2006; Korte & Hüsing, 2006). In instruction practice teachers usually use ICT more for teaching preparation, less for educational aims and activities (Economides & Zaranis, 2010). They commonly adopt ICT for Mathematics, Science and Computer Science, followed by General Primary Education, Vocational Education and Humanities and Social sciences. The subject matter of Literature and Languages, Physical and Artistic/Crafts Education are least taught by ICT (Korte & Hüsing, 2006). The important barriers and difficulties of ICT usage in education stated by the teachers are: insufficient equipment in school, teachers' limited skills and subject unsuitable for computer teaching (European Commission, 2006; Economides & Zaranis, 2010). Though there is a lack of sufficient and detailed information on actual ICT use of preschool teachers, the studies above regarding the whole education can also paint a picture for us.

In China, the introduction of ICT into preschool education began in the 1990s, quite later than other European countries. As a result, ICT-related research and practices are now at an early stage (Guo, 2007). Although the central government had formulated and implemented a series of policies and projects on ICT infrastructure and teacher training, including "School to School Network Project", "Teachers' Professional Development for ICT in Education", "Modern Distance Education for Schools in Rural Areas Projects", "National Educational Technology Standards for Teachers" (Zhao & Xu, 2010), these projects simply focus on primary and secondary education. Preschool education in China, does not belong to primary education, and it is a separate part, so preschool education and preschool teachers are not included in the above mentioned projects. In other words, on government level, there are no explicit and direct policies and projects for ICT educational application in kindergartens.

In the academic field, recent studies (Liu, 2007; Guo, 2007) indicate that the majority of Chinese kindergartens have made great progress in ICT infrastructures. A large proportion of them has been equipped with computers, printers, scanners, digital cameras and videos, and has got access to the internet. Some better-conditioned kindergartens have set up independent multimedia classrooms and computer classrooms (Han, 2003;

Pu, 2005; Liu, 2007; Guo, 2007). Some studies also report an issue which widely exists in China concerning ICT infrastructure use, particularly in Mainland China, and is named "digital divide", which is apparent between public and private kindergartens, as well as kindergartens between urban and rural areas (Liu, 2007； Guo et al., 2006).

Regarding the status of ICT use by teachers in Chinese kindergartens, it is found that the utilization level and frequency rate of ICT facilities are extremely low (Pu, 2005; Guo, et al., 2006; Liu, 2007), and the hours of use are limited (Liu, 2010). Among these ICT-related activities, teachers mainly use ICT to search for online teaching resources like pictures, texts and courseware (Liu, 2007). In general, teachers frequently incorporate ICT into the subjects of Science, Language and Art, and seldom into Social and Physical fields (Liu, 2007; Guo et al., 2006). Although many teachers have interest to introduce ICT into classroom activities, it is very difficult for them to implement in real teaching practice (Han, 2003). The main challenges and obstacles are summarized into: lack of guidelines, lack of resources and technical support, lack of educational software in Chinese language, teachers' inadequate capacity of ICT use, ICT illiterate parents, insufficient time, heavy workload and pure organization environment (Leung, 2003; Li, 2006; Han, 2003; Meng, et al., 2011).

3.2. ICT and Preschoolers

Although there are recent studies stating the negative effects of ICT use of young children (Funk er al., 2003; Straker et al., 2006), many researchers worldwide have shown the importance of ICT use of young children either at school or at home (CEO Forum, 1999; Rideout et al., 1999; Rideout et al., 2003; Christakis et al., 2004; Pange, 2008). Many preschoolers, nowadays called "digital natives" (Prensky, 2001) are already familiar with ICT even at their home environment using them as educational and entertainment tools. Due to inherent characteristics and advantages, ICT can easily adjust to individual specific needs and abilities, as well as attract their interests and concentration. In particular at preschool level, ICT functions in different fields of children's development and learning (Vernadakis, 2005; Toki & Pange, 2009; Nikiforidou & Pange, 2010; Panagiotakoua & Pange, 2010; Fesakis, 2011; Zaranis & Kalogiannakis, 2012; Bratitsis, 2012; Gao, 2011; Zuo & Jia, 2010; Wang, 2012; Xing, 2010; Yu & Li, 2009; Wu & Li, 2008; Gao, 2011).

In Greece, Vernadakis et al. (2005) show that computer assisted instruction (CAI) can have a significant effect on children's cognitive, emotional, linguistic and literacy skills. Other findings reach the same conclusion that teaching and learning through ICT can increase children's academic performance and learning outcomes (Lovari & Charalambous, 2006; Fesakis, 2011). More specifically, these outcomes could be focused on various subjects such as science (Zaranis & Kalogiannakis, 2012; Kalogiannakis & Zaranis, 2012), mathematics (Nikiforidou & Pange, 2010), language (Toki & Pange, 2009; Toki & Pange, 2010) and music (Panagiotakoua & Pange, 2010). Even the children who are at risk of learning disabilities can obtain good learning results in the environment of ICT (Toki, 2012). Moreover, children's motivation (Bratitsis, 2012), social ability (Fesakis & Sofroniou, 2011; Brastitsis, 2012) and creativity (Panagiotakoua & Pange, 2010; Bratistsis, 2012) could be triggered in the process of using ICT.

A range of findings in China also prove the significance of ICT in preschoolers' learning activities. It has been indicated that ICT can play a crucial role in children's mental development, abstract thinking and later academic performance (Gao, 2011). Other researchers argue that if the preschool teachers are able to apply ICT effectively, it can improve children's mathematics performance (Zuo & Jia, 2010), language (Wang, 2012; Wan, 2011), science (Xu, 2011), art (Fan, 2007; Guan et al., 2007; Guo, 2011), music (Zhu, 2011), social abilities (Xing, 2010; Wang, 2011), creativity (Yu & Li, 2009) and imagination development (Wu & Li, 2008). In a broader sense, children's early exposure to ICT can also benefit the future life and career (Gao, 2011).

3.3. ICT and Preschool Teachers

The role of teachers in the application of ICT in preschool settings, has been well recognized in all examined papers. The views and attitudes of teachers at preschools, as stated worldwide, are of vital importance in

exploiting educational potentials of ICT (Violato et al., 1989; Czerniak & Lumpe, 1996; Tsitouridou & Vryzas, 2004). They may become the predictors of teachers' behaviors of incorporating ICT into students' teaching and learning (Nikolopoulou &, Tsitouridou & Vryzas 2004; Pange; 2008, Gialamas, 2009; Pange et al.2011). The degree of teachers' competences on ICT and effective training, have also positive influence on successful integration of ICT into classroom (Ashton & Webb, 1986; Nikolopoulou & Gialamas, 2009; Gialamas & Nikolopoulou, 2010).

Studies in Greece make reference to teachers' views ("views-intentions" are mentioned in some studies) and attitudes towards ICT at preschool level. They find that preschool teachers generally express favorable attitudes to computer and/or ICT use in education (Tsitouridou & Vryzas, 2003, 2004; Gialamas et al., 2008; Pange 2008). Whereas, due to ICT's possible side effects on children, the teachers also present reservations and temperate attitudes (Tsitouridou & Vryzas, 2003, 2004). Teachers' views and attitudes are frequently influenced by a series of factors, for instance, years of service, knowledge and experience of ICT, computer ownership and usage at home, confidence of ability, in-service training (Tsitouridou & Vryzas, 2003, 2004; Gialamas et al., 2008). Petrogiannis (2010). Teachers' readiness for computer adoption are significantly associated with other psychological parameters, including internal ability of control, perceived stress, attitude of computer, perceived usefulness, ease and anxiety. Even though some differences do exist between pre-service and in-service preschool teachers (pre-service teachers show higher self-efficacy and experience of ICT, while in-service teachers show more positive views-intentions) (Gialamas & Nikolopoulou, 2010). Pre-service teachers also tend to be positive to ICT usage, although there is enough room for improvement (Pange et al. 2008; Toki et al., 2009). The views and attitudes of pre-service teachers may be affected by similar factors such as years of study, self-efficacy of ICT and access to ICT at home (Nikolopoulou & Gialamas, 2009). According to Gialamas and Nikolopoulou (2010) the efforts should be put into the formulation and implementation of teachers' training programs, in order to help teachers develop scientific views and attitudes towards ICT.

In Greek universities, departments of early childhood education, have integrated ICT modules into students' curriculum, aiming at developing pre-service teachers' competence of ICT use in education (Nikolopoulou & Gialamas, 2009; Toki & Pange, 2011). As to in-service preschool teachers training, a series of training programs both at national level and European level were launched, such as "Teachers' Training in ICT in Education", "Preparation of Teachers for the Information Society/Initial In-service Training for all Teachers in Information and Communication Technologies" (Nikolopoulou & Gialamas, 2009; Tsitouridou & Vryzas, 2004). Moreover, there is plenty of evidence of research referring to teachers' ICT literacy and training (Pange, 2004; Toki, et al., 2009; Pange, 2011; Toki & Pange, 2013). Whereas, Gialamas et al. (2008) point out that the training programs for preschool teachers are far behind systemization and characterized by techno-centered orientation.

Similarly, a broad range of studies in China report that preschool teachers have realized the importance of ICT (Liu, 2010), and considered ICT as a helpful tool not only in teaching practice, but also in teachers' professional development (Pu, 2005). However, preschool teachers' self-confidence and capacities of ICT integration into education are relatively at low level. Specifically, they possess the elementary competences (retrieval, processing, management information etc.) and could apply some simple teaching software (PowerPoint, flash, Photoshop etc.), yet lacking advanced abilities especially in the integration of ICT and teaching activities (Liu, 2007, 2010; Tian & Liu, 2009; Pu, 2005).

Research in China, reveals that the majority of kindergartens have started courses to support teachers' training and most of the teachers have attended trainings in various ICT topics and at different educational levels (Liu, 2007; Pu, 2005; Guo et al., 2006). However, it is revealed that the outcome of the training was not effective and teachers did not benefit a lot for their teaching process. Meanwhile, numerous questions emerge in preschool teachers training, including single teacher's training opportunities, hard to connect theory to practical application, offer of non-systematic courses, and diversity from teachers' needs (Liu, 2007; Meng, 2011). Liu (2011) considers that it is necessary to reorganize and expand modules of teachers' training (national, regional and kindergarten level).

4. Discussion - Conclusion

This study analyzed and compared related research evidences on ICT use in preschool education in Greece and China. According to the facts, it was found that both Greece and China had made great progress in research and practice of ICT use in preschool education, meanwhile more work needed to be done for the further application of ICT in kindergartens. In conclusion the two countries demonstrated the following common points:

- ICT hardware and software provision was greatly improved, and their usage was steadily rising.
- Teachers' ICT use for teaching process leaved sustainable space for improvement, regarding the degree, frequency, time, subject and time of usage.
- A consensus was reached on ICT's benefits on preschoolers by preschool teachers: children's early exposure to ICT in preschool settings had a positive contribution to their learning and development, which was confirmed in various learning fields and subjects.
- The majority of teachers including pre-service and in-service teachers were in favor of ICT use in class, however lacking necessary knowledge and skills, particularly on integrating ICT into teaching activities.
- Teachers' training was supported by governments and kindergartens, and related training programs were conducted, whereas the efficiency and validity were relatively low. Most of the programs were inclined to be techno-centric, without providing an educational purpose of ICT application.
- Teachers were facing shared difficulties and barriers, including inadequate facilities and resources, lacking capacity needed and insufficient training.

But there were also some dissimilarities in the application of ICT in preschool settings in both countries, according to our research findings:

- For the ICT policies and programs, Greek government encouraged and guided ICT use in preschool education, and had implemented several relevant projects and policies. However, in China, there were no specific and explicit governmental policies and projects for ICT use in preschool education.
- With regard to ICT resource distribution, the "digital divide" in China was more obvious than in Greece. This phenomenon can be expressed in three aspects: the social gap among different kindergartens; the geographical split between east and west regions; the socio-economical gap between urban and rural areas. Yu and Wang (2002) states that "digital divide" has become one of the major challenges in China and reducing this distance can promote economic development and ICT application in education.

In conclusion, ICT use is of vital significant in preschool educational process. It can become one valuable tool for teaching and learning when properly used by teachers (Lovari & Charalambous, 2006). However, both in Greece and China, the teachers have to face several factors which affect ICT's effective usage for their teaching. So it is important to:

- Formulate and implement national and regional policies and project on ICT use in preschool settings, particularly in China. Policy guidance enables systematic and sustainable improvement in infrastructure development, resource allocation, technical support and teachers' training (Kozma, 2008). In addition, ICT policies and projects need to take more consideration into rural regions, and less developed kindergartens in order to bridge the gap.
- Every kindergarten has to develop its own school policy. It can offer the concrete method to realize the shared vision provided by national and regional policies and projects (OECD 2006). Every school entity may focus either on developing courses on ICT curriculum construction, or on online resource applications, or online technical support or on formal and informal teacher' training.
- Both government and kindergarten ought to ensure efficient, systematic and on-going teacher training, especially focusing on the advanced skills in integrating ICT into routine teaching practice (UNESCO, 2008).

- Teachers also have to use social learning theories in order to attend efficient distance learning programs. These learning methods include self-regulated learning for e-learning and m-learning (Pange, 2005, 2011; Agorogianni, 2009; Wishart, 2009; Seppälä & Alamäki, 2003) and nearest neighbor learning (Toki & Pange, 2006, 2007; Pange 2007) for teachers group learning strategies.

References

Angeli, C. (2004). The effects of case-based learning on early childhood pre-service teachers' beliefs about the pedagogical uses of ICT. *Journal of Educational Media*, 29(2), 139-151.

Agorogianni, A. Z., Zaharis, Z. D., Anastasiadou, S. D., & Goudos, S. K. (2009). Distance learning technology and service support in Greece: The case study of the Aristotle University over the last decade. *Education and Information Technologies*, 16, 25-39.

Ashton, P. T., & Webb, R. B. (1986). *Making a difference: teachers' sense of efficacy and student achievement*. New York: Longman.

Becker, J. H., & Ravitz, J. L. (2001). Computer use by teachers: Are Cuban's predications correct? *The Annual Meeting of American Educational Research Association*. Seattle, Washington.

Bratitsis, T., Kotopoulos, T., & Mandila, K. (2012). Kindergarten children's motivation and collaboration being triggered via computer while creating digital stories: A case study. *International Journal of Knowledge and Learning*, 8(3-4), 239-258.

CEO Forum. (1999). The power of digital learning: Integrating digital content. *CEO Forum on Education & Technology*. Retrieved 29th May, 2013, from http://www.ceoforum.org.

Chen, J., & Chang, C. (2006). Using computers in early childhood classrooms: Teachers' attitudes, skills and practices. *Journal of Early Childhood Research*, 4(2), 169-188.

Christakis, D. A., Ebel, B. E., Rivara, F. P., & Zimmerman, F. J. (2004). Television, video, and computer game usage in children under 11 years of age. *Journal of Pediatrics, 145(5),*652-656.

Christina, C. W. H. (2003). Challenges of using ICT in Hong Kong early childhood settings. *IFIP Working Group 3.5 Conference: Young Children and Learning Technologies*. Parramatta, Australia.

Czerniak, C. M., & Lumpe, A. T. (1996). Relationship between teacher beliefs and science education reform. *Journal of Science Teacher Education*, 7(4), 247–266.

European Commission. (2006). Benchmarking access and use of ICT in European schools 2006. Key Findings per Country of Final Report. Retrieved 21th June, 2013, from http://ec.europa.eu/information_society/newsroom/cf/itemlongdetail.cfm?item_id=2888

Fan, W. (2007). The effects of computer drawing in kindergarten' art teaching [in Chinese: 电脑绘画在幼儿园美术活动中的作用初探] . *Network Technology Times*, 23, 84-86.

Fesakis, G., Sofroniou, C., & Mavroudi, E. (2011). Using the internet for communicative learning activities in kindergarten: The case of the "Shapes Planet". *Early Childhood Education Journal*, 38(5), 385-392.

Funk, J. B., Buchman, D. D., Jenks, J. & Bechtoldt, H. (2003). Playing violent video games, desensitization, and moral evaluation in children. *Applied Developmental Psychology*, 24, 413-436.

Gao, X. (2011). Reflection of Chinese preschool education in the context of Information Technology era [in Chinese: 信息技术时代下中国学前教育的思考]. *China Education Info*, 18, 32.

Gialamas, C., Nikolopoulou, C., & Manesis, D. (2008). Views and intentions on preschool integration and use of ICT in early childhood education [in Greek: Απόψεις και προθέσεις νηπιαγωγών σχετικά με την ενσωμάτωση και χρήση των ΤΠΕ στην προσχολική εκπαίδευση]. *Integration and Use of ICT in Preschool Education*, 53(7), 369-378.

Gialamas, V., & Nikolopoulou, K. (2010). In-service and pre-service early childhood teachers' views and intentions about ICT use in early childhood settings: A comparative study. *Computers & Education*, 55, 333–341.

Guan, J., Cao, H., & Wang, Q. (2007). Function of multimedia in art teaching in pre-school [in Chinese: 多媒体在幼儿美术教育中的作用]. *Journal of Baoshan Teachers College*, 26(6), 78-80.

Guo, J. (2011). The use of IT in kindergarten's art teaching [in Chinese: 信息技术在幼儿园美术教学中的应用]. *China Modern Educational Equipment*, 20, 57-58.

Guo, L. (2007). *ICT and early childhood education* [in Chinese: 信息技术与早期教育]. Shanghai: East China Normal University Press.

Guo, L., Qian, Q., Wang, J., & Zeng, Z. (2006). Investigation and analysis of kindergartens' IT use in Shanghai [in Chinese: 上海市幼儿园应用息技术的调查与分析]. *Shanghai Research on Education*, 6, 37-40.

Hepp, P. (2004). Enlaces: The Chilean ICT in education program. *Presented at the APEC Education Ministerial Meeting.* Santiago, Chile.

Kalogiannakis, M., & Zaranis, N. (2012). Preschool science education with the use of ICT: A case study. In C. Bruguière, A. Tiberghien & P. Clément (Eds.), *Proceedings of the ESERA 2011 Conference: Science Learning and Citizenship*. Lyon, France.

Korte, W. B., & Hüsing, T. (2006). Benchmarking access and use of ICT in European schools 2006 - results from head teacher and classroom teacher surveys in 27 European countries. In A. Méndez-Vilas., et al. (Eds.), *Current Developments in Technology-assisted Education*. Badajoz, Spain.

Kozma, R. B. (2008).Comparative analysis of policies for ICT in education. In J. Voogt, & G. Knezek (Eds.), *International handbook of information technology in primary and secondary education.* New York: Springer.

Lee, Y. J., Huang, D., & Cheah H. M. (2008*).* ICT and educational policy in the Asia-Pacific region. In J. Voogt & G. Knezek (Eds.), *International handbook of information technology in primary and secondary education.* New York: Springer.

Leung, W. M. (2003). The shift from a traditional to a digital classroom: Hong Kong kindergartens. *Childhood Education*, 80(1), 12-17.

Li, H. (2006). Integrating Information and Communication Technologies into the early childhood curriculum: Chinese principals' views of the challenges and opportunities. *Early Education and Development*, 17(3), 467–487.
Liu, Z. (2007). *The situation and solutions of preschool educational informationization in Zhejiang province* [in Chinese: 浙江省学前教育信息化现状的调查分析及对策研究]. *China Educational Technology,* 8, 34-38.
Liu, Z. (2010). Investigation and analysis of information literacy of preschool teachers [in Chinese: 幼儿教师信息素养现状调查与分析]. *Modern Educational Technology*, 20(11), 64-68.
Liu, Z. (2011). Study on training models of preschool teachers' information literacy [in Chinese: 幼儿教师信息素养培养模式研究]. *China Educational Technology*, 5, 106-108.
Lovari, D., & Charalambous, K. (2006). Comparison of results using Information and Communication Technology and conventional media in teaching and learning processes in preschool education [in Greek: Σύγκριση των αποτελεσμάτων χρήσης τεχνολογιών πληροφορίας και επικοινωνιών με τη χρήση συμβατικών μέσων στις διαδικασίες διδασκαλίας και μάθησης σε συγκεκριμένη θεματική ενότητα της προσχολικής εκπαίδευσης]. *9th Conference of the Cyprus Pedagogical Association*, 495-506.
Meng, H., Kong, X., & Qian, L. (2011). Questions and solutions of preschool teachers' Information Technology training - based on the investigation of status of preschool teachers' Information Technology skills in Hebei province [in Chinese: 幼儿教师信息技术培训问题及对策研究—基于河北省幼儿教师信息技术技能的现状调查]. *Journal of Adult Education of Hebei University*, 13(1), 61-62.
Ministry of Education, Finland. (2004). *Information society programme for education, training, and research: 2004-2006*. Helsinki: Ministry of Education.
Ministry of Education, Singapore. (2008). MOE launches third masterplan for ICT in education. Retrieved 18th June, 2013, from http://www.moe.gov.sg/media/press/2008/08/moe-launches-third-masterplan.php
Natsiopoulou, T., & Bletsou, M. (2011). Greek preschoolers' use of electronic media and their preferences for media or books. *International Journal of Caring Sciences*, 4(2), 94-104.
Natsiopoulou, T., Melissa-Halikiopoulou C., & Lioliou, C. (2013). Effects of family socioeconomic status on parents' views concerning the integration of computers into preschool classrooms. *International Journal of Caring Sciences*, 6(1), 98-104.
Nikiforidou, Z., & Pange, J. (2010). "Shoes and Squares": A computer-based probabilistic game for preschoolers. *Procedia Social and Behavioral Sciences*, 2, 3150–3154.
Nikolopoulou, K., & Gialamas, V. (2009). Investigating pre-service early childhood teachers' views and intentions about integrating and using computers in early childhood settings: compilation of an instrument. *Technology, Pedagogy and Education*, (18)2, 201-219.
Nikolopoulou, K., Gialamas, V., & Batrsouta, M. (2010). Young children's access to and use of ICT at home. *Review of Science, Mathematics and ICT Education*, 4(1), 25-40.
Organization for Economic Cooperation and Development. (2006). *Are students ready for a technology-rich world? What PISA tells us*. Paris: OECD.
Pagourtzi, E. (2009). Women and e-commerce [in Greek: Γυναίκες και ηλεκτρονικό επιχειρείν]. *Observatory for the Information Society* [in Greek: Παρατηρητήριο για την Κοινωνία της Πληροφορίας]. Retrieved 30th May, 2013, from http://www.observatory.gr/Files/Meletes/090526_ppt_iagme.pdf
Panagiotakoua, C., & Pange, J. (2010). The use of ICT in preschool music education. *Procedia Social and Behavioral Sciences*, 2, 3055–3059.
Pange, A., Toki, E. I., & Pange, J. (2008). Are university students ready for m-learning? A pilot study in Greece. *IADIS International Conference Mobile Learning Proceedings*.
Pange, J. (2003). Teaching Probabilities and Statistics to Preschool Children. *Information Technology in Childhood Education Annual*, 2003(1), 163-172.
Pange, J. (2005). Formal, non-formal and informal education in Greece [in Greek: Τυπική, μη-τυπική και άτυπη μάθηση στην Ελλάδα]. Retrieved 22h May, 2013, from http://equipe.up.pt/RESOURCES/cases.htm
Pange, J. (2008). *Educational technology* [in greek: Εκπαιδευτική τεχνολογία]. Ioannina, Greece: PBS Theothorides.
Pange, J. (2011). *Teaching about new technologies to preschool teachers*. Retrieved 11th June, 2013, from http://equipe.up.pt/RESOURCES/Casestudies/sg2ioannina.pdf.
Pange, J., Toki, E. I. & Lekka, A. (2011). Distance learning: a myth or a necessity for educators? *Proceedings of IADIS International Conference on Higher Education*. Shanghai, China.
Pange, J., Leontitsis, A., & Siogka, E. (2004). Are the Greek preschool teachers able to use distance learning technologies?. *ITHET: Paper presented at the fifth International Conference on Information Technology Based Higher Education and Training.*
Papanastasiou, E., C., & Angeli, C. (2008). Evaluating the use of ICT in education: Psychometric prosperities of the survey of factors affecting teacher teaching with technology (SFA-T3). *Educational Technology & Society*, 11(1), 69-86.
Petrogiannis, K. (2010). The relationship between perceived preparedness for computer use and other psychological constructs among kindergarten teachers with and without computer experience in Greece. J*ournal of Information Technology Impact*, 10(2), 99-110.
Plowman, L., & Stephen, C. (2005). Children, play and computers in pre-school education. *British Journal of Educational Technology*, 36(2), 145-157.
Plowman, L., McPake, J., & Stephen, C. (2008). Just Picking it up? Young children learning with technology at home. *Cambridge Journal of Education*, 38(3), 303-319.
Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, MCB University Press*, 9(5), 1-6.
Pu, Y. (2005). Improve information literacy and promote preschool teachers' professional development [in Chinese: 提高信息素养，促进幼儿教师专业发展]. *Shanghai Research on Education*, 11, 94-95.
Rideout, V. J., Foehr, U. G. Roberts, D. F. & Brodie, M. (1999). *Kids and media and the new millennium.* Menlo Park, CA: The Kaiser Family foundation.

Rideout, V. J., Vandewater, E. A., & Wartella, E. A. (2003). *Zero to Six: Electronic media in the lives of infants, toddlers, and preschoolers.* Menlo Park, CA: Kaiser Family Foundation.
Seppälä, P. & Alamäki, H. (2003). Mobile learning in teacher training. *Journal of Computer Assisted Learning*, 19, 330-335.
Schmid, R. F., Bernard, R. M., Borokhovski, E., Tamim, R., Abrami, P. C., Wade, C. A., et al. (2009). Technology's effect on achievement in higher education: a Stage I meta-analysis of classroom applications. *Technology Use in Higher Education*, 21, 95–109.
Siraj-Blatchford, J., & Whitebread, D. (2003). *Supporting ICT in the early years*. Open University Press.
Straker, L. M., Pollock, C. M., Zubrick, S. R. & Kurinczuk. (2006). The association between information and communication technology exposure and physical activity, musculoskeletal and visual symptoms and socio-economic status in 5-year-olds. *Child: Health, Care and Development*, 32 (3), 343-351.
Suhonen, J. (2011). *Greece (Hellas)*. Retrieved 11th June, 2013, from https://wiki.uef.fi/display/IMPDET/Greece+%28Hellas%29#
Tezci, E. (2009). Teachers' effect on ICT use in education: the Turkey sample. *Procedia Social and Behavioral Science*, 1, 1285-1294.
Tian, J., & Liu, L. (2009). The status, development and improvement of preschool teachers' information literacy [in Chinese: 试析我国幼儿教师信息素养的现状、培养与提高]. *Journal of Liaoning Education Administration Institute*, 26(5), 52-53.
Toki, E. I., Drosos, K., & Simitzi, D. (2012). Development of digital multimedia resources to support early intervention for young children at-risk for learning disabilities. *Pedagogy – Theory & Praxis*, 5, 129-142.
Toki, E. I., Pange, A., & Pange, J. (2009). The necessity of ICT literacy in Undergraduate Educational Departments students. In A. Méndez-Vilas, A. Solano Martín, J. A. Mesa González, & J. Mesa González (Eds.), *Research, Reflections and Innovations in Integrating ICT in Education.* Badajoz, Spain.
Toki, E. I. & Pange, J. (2006). A comparative study of two learning methods: Collaborative learning versus nearest neighbor learning. *EISTA 2006 Proceedings*, Orlando, Florida, USA.
Toki, E. I. & Pange, J. (2007). Nearest Neighbor Learning: A learning model and an e-learning experience. *3rd Conference of HSSS Proceedings.* Peiraias, Greece.
Toki, E. I., & Pange, J. (2009). Exploiting the possibility of online courses for speech and language therapy and learning. *5th International Conference in Open & Distance Learning*. Athens, Greece.
Toki, E. I., & Pange, J. (2010). E-learning activities for articulation in speech language therapy and learning for preschool children. *Procedia Social and Behavioral Sciences*, 2, 4274–4278.
Toki, E. I., & Pange, J. (2011). Evaluation of online presence and further training through the websites of the Departments of Higher Education. In B. D. Economides (Eds.), *Education and teacher training theoretical and educational approaches* (pp. 462-471). Athens: Pedio.
Toki, E. I. & Pange, J. (2012). Traditional and computer-based evaluation of preschoolers' oral language in Greek - A review of the literature. *Sino-US English Teaching,* 9(1), 840-845.
Toki, E. I., & Pange, J. (2013). Social learning theories as tools for learning in an ICT educational system. *The Online Journal of New Horizons in Education*, 3(1), 53-55.
Toki, E. I., Pange, J., & Mikropoulos, T. A. (2012). An online expert system for diagnostic assessment procedures on young childers's oral speech and language. *Procedia Computer Science*, 14, 428-437.
Tondeur, J., Van Braak, J., & Valcke, M. (2007). Curricula and the use of ICT in education: Two worlds apart? *British Journal of Educational Technology*, 38(6), 962-976.
Tsitouridou, M., & Vryzas, K. (2003). Early childhood teachers' attitudes towards computer and Information Technology: the case of Greece. *Information Technology in Childhood Education Annual,* 1, 187-207
Tsitouridou, M., & Vryzas, K. (2004). The prospect of integrating ICT into the education of young children: the views of Greek early childhood teachers. *European Journal of Teacher Education*, 27(1), 29-45.
UNESCO. (2008). *ICT competency standards for teachers: A policy framework*. Paris: UNESCO. Retrieved 20th June, 2013, from http://www.unesco.org/new/en/communication-and-information/resources/publications-and-communication-materials/publications/full-list/ict-competency-standards-for-teachers-policy-framework/
United Nations. (2005). *World Summit on the Information Society: Tunis Commitment*. New York: United Nations.
Vernadakis, N., Avgerinos, A., Tsitskari, E., & Zachopoulou, E. (2005). The use of computer assisted instruction in preschool education: making teaching meaningful. *Early Childhood Education Journal*, 33(2), 99-104.
Violato, C., Mariniz, A., & Hunter, W. (1989). A confirmatory analysis of a four-factor model of attitudes toward computers: a study of preservice teachers. *Journal of Research on Computing in Education*, Winter, 199–213.
Voogt, J., & Mckenney, S. (2008). Using ICT to foster (pre)reading and writing skills in young children. *Computer in the Schools*, 24(3-4), 83-94.
Wan, J. (2011). Promoting preschoolers' language development with modern teaching media [in Chinese: 利用现代教学媒体的优势促进幼儿语言发展]. *The Chinese Journal of ICT in Education*, 16, 38-39.
Wang, H. (2011). Establishing effective situations through IT to promote preschoolers' development of social abilities [in Chinese: 信息技术创设有效情境，促进幼儿社会能力发展]. *China Modern Educational Equipment*, 20, 63-65.
Wang, Y. (2012). Using IT for optimizing preschoolers' language teaching [in Chinese: 运用信息技术，优化幼儿语言教学]. *China Educational Technology & Equipment*, 10, 95.
Wartella, E., Vandewater, E. & Rideout, V. (2005). Introduction: electronic media use in the lives of infants, toddlers and preschoolers. *American Behavioral Scientist*, 48(5), 501-204.
Wise, S., Greenwood, J., & Davis, N. (2011). Teachers' use of digital technology in secondary music education: Illustrations of changing classrooms. *British Journal of Music Education*, 28, 117-134.
Wishart, J. (2009). Use of mobile technology for teacher training. In M. Ally (Eds.), *Mobile learning: transforming the delivery of education and training*. Athabasca: AU Press.

World Bank. (2003). *ICT and MDGs: a World Bank perspective*. Washington, DC: World Bank.
Wu, M., & Li, M. (2008). Promoting preschoolers' development of imagination with IT [in Chinese: 信息技术促进学前幼儿想象力发展]. *China Information Technology Education*, 3, 108-109.
Xing, J. (2010). The validity of IT in kindergarten's social teaching activities [in Chinese: 信息技术在幼儿园社会教学活动中的有效性]. *The Chinese Journal of ICT in Education*, 24, 49-50.
Xu, M. (2011). It is the "mistake" of IT: preschoolers' science education in the context of IT [in Chinese: 都是信息技术惹的"获"—谈信息技术环境下的幼儿科学教育]. *China Modern Educational Equipment,* 20, 61-62.
Yu, S. Q., & Wang, M. J. (2006). Modern distance education project for the rural schools of China: recent development and problems. *Journal of Computer Assisted Learning*, 22, 273-283.
Zaranis, N., & Kalogiannakis, M. (2012). The use of ICT in preschool education for science teaching with the Van Hiele theory. In S. Divjak (Eds.), *Proceedings of the 8th International Conference on Hands-on Science.* Ljubljana, Slovenia.
Zhao, J., & Xu, F. (2010). The state of ICT education in China: A literature review. *Frontiers of Education in China*, 5(1), 50-73.
Zhu, J. (2011). The integration of IT and preschoolers' music enjoyment activities [in Chinese: 信息技术与幼儿音乐欣赏活动整合]. *China Modern Educational Equipment,* 20, 49-51.
Zuo, S., & Jia, G. (2010). Using modern IT to promote preschoolers' mathematics abilities' development [in Chinese: 借助现代信息技术促进幼儿数学能力发展]. *Journal of Cangzhou Teachers' College*, 26(4), 112,118.